Evolution®

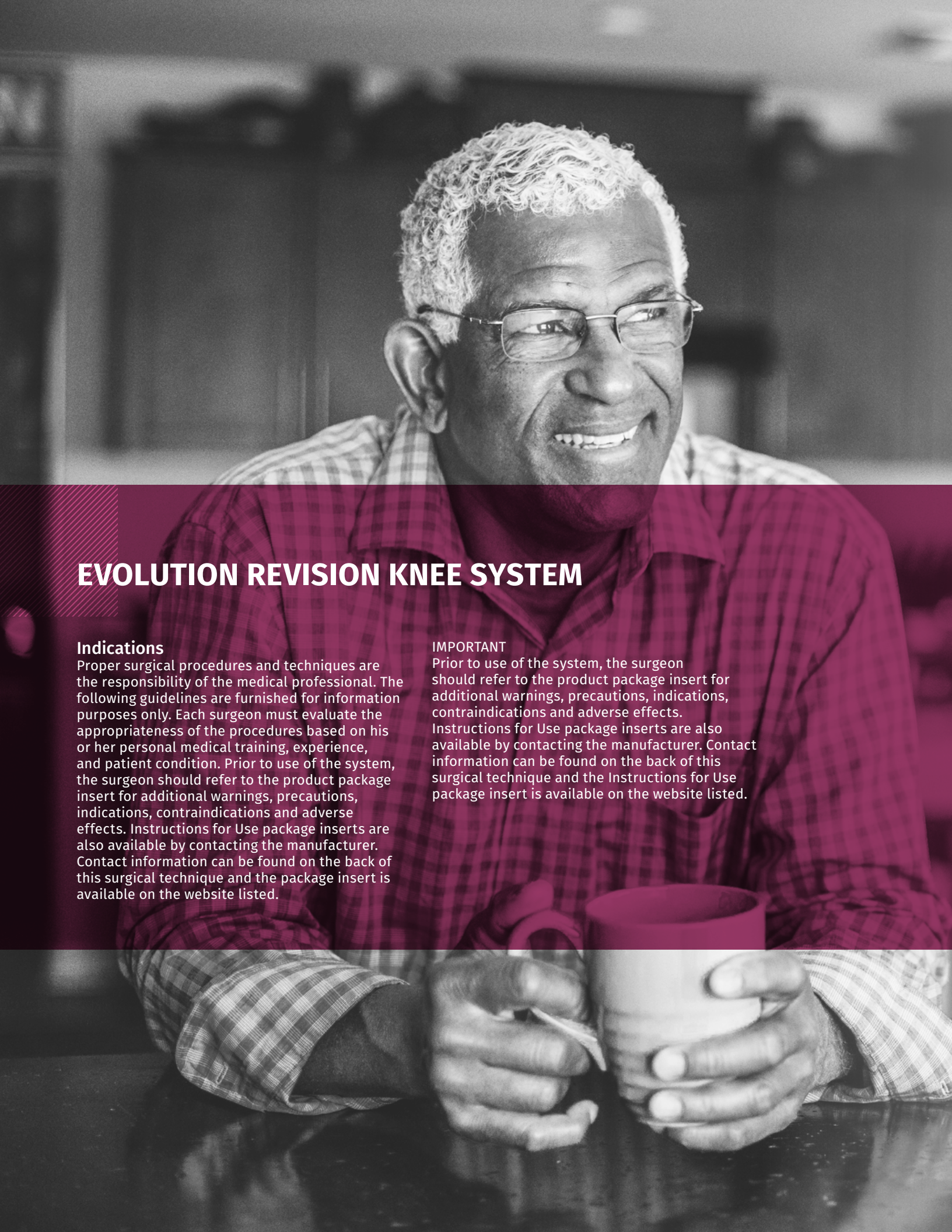
MEDIAL-PIVOT KNEE SYSTEM

Streamlined femoral surgical technique

Revision knee system

MicroPort Orthopedics

Full Function, Faster®



EVOLUTION REVISION KNEE SYSTEM

Indications

Proper surgical procedures and techniques are the responsibility of the medical professional. The following guidelines are furnished for information purposes only. Each surgeon must evaluate the appropriateness of the procedures based on his or her personal medical training, experience, and patient condition. Prior to use of the system, the surgeon should refer to the product package insert for additional warnings, precautions, indications, contraindications and adverse effects. Instructions for Use package inserts are also available by contacting the manufacturer. Contact information can be found on the back of this surgical technique and the package insert is available on the website listed.

IMPORTANT

Prior to use of the system, the surgeon should refer to the product package insert for additional warnings, precautions, indications, contraindications and adverse effects. Instructions for Use package inserts are also available by contacting the manufacturer. Contact information can be found on the back of this surgical technique and the Instructions for Use package insert is available on the website listed.

Table of contents

Introduction

The Evolution® Revision Knee System is built on a 20-year, clinically-proven heritage of patient satisfaction and survivorship. It is the first revision knee system that maintains the proven kinematic benefits of a medial-pivot design, while also offering surgeons intra-operative flexibility to meet all surgical needs.

Ordering Guide: 019743A - Evolution® Streamlined Stemmed CS/CCK Ordering Guide

Surgeon design team

Dr. Michael Anderson, MD
Fellowship-Trained Orthopedic Surgeon
Aurora Sinai Medical Center
Milwaukee, WI

David Backstein, MD, MEd, FRCSC
Associate Professor, University of Toronto
Head, Gluskin Granovsky Division of Orthopaedics
Mount Sinai Hospital
Toronto, Ontario

J. David Blaha, MD
Clinical Professor Emeritus, Orthopaedic Surgery
Universtiy of Michigan Health System
Ann Arbor, MI

David DeBoer, MD
Fellowship-Trained Orthopedic Surgeon
Southern Joint Replacement Institute
Nashville, TN

Donald Knapke, MD
Fellowship-Trained Orthopedic Surgeon
Beaumont Hospital
Troy, MI

Stephen Incavo, MD
Section Chief, Adult
Reconstructive Surgery
Houston Methodist Hospital
Houston, TX

Joost Lagast, MD
Orthopedic Surgeon
Maria Middelares Hospital
Ghent, Belgium

Tokifumi Majima, MD, PhD
Professor, Orthopaedic Surgery
Nippon Medical School
Tokyo, Japan

Philippe Van Overschelde, MD
Orthopedic Surgeon
Maria Middelares Hospital
Ghent, Belgium

Design overview

INTELLIGENT DESIGN

Canal filling stems

- Contain splines and flutes to provide immediate fixation and torsional resistance
- Flexible coronal slot provides dynamic structure to address long-term endosteal bone changes
- Diameters of 10-24mm in 1mm increments
- Lengths of 100 and 150mm
- With stem adaptors available

Offset adapters

- 360° of offset rotation for optimal bone coverage
- 4 and 8mm offset
- 25mm length
- Femoral offset has a boss at the top of the taper to prevent mating with the tibia

Extension adapters

- Extend total length of the stem for additional fixation
- 25 and 50mm lengths
- 17mm diameter

CCK and stemmed CS femoral implant

- Trunnion height is 35mm
- Stem housing at 5° valgus

Distal and posterior femoral augments

- Available in 4mm, 8mm, 12mm thicknesses
- Attach with single threaded screw

CCK tibial insert

- One-up and one-down size interchangeability
- +/-4° of internal-external rotation and +/-2° of varus-valgus constraint
- Allows up to 125° range-of-motion
- Pass-through locking screw provides additional fixation and stability

CS tibial insert

- Asymmetric to position mating femur more posterior
- One-up and one-down size interchangeability
- Soft tissue friendly patellar tendon relief
- 15° of permissible femoral rotation
- For use with Evolution Primary CS or Stemmed CS femur

Revision tibial base implant

- Asymmetric for improved bone coverage
- 0° posterior slope
- Enhanced locking mechanism angled in direction of the incision

Tibial augments

- 5, 10 and 15mm thick, medial and lateral options
- 10 and 15mm augments taper to match the natural tibial geometry

Modular keel

- Two sizes to optimize rotational stability
- +/- 30° rotation without augments
- +/- 6° rotation with augments

Cemented stems

- 17mm diameter in lengths of 25 and 50mm
- 10, 12, 14, 16, and 18mm diameters in a length of 75mm

NOTE: Streamlined instrument set not compatible with all implants in the system

P/N E5001002

P/N E5001003

P/N E5001003

Surgical technique

Preparation of the distal femur

Starter hole preparation

Initiate an opening in the femoral canal with the 9.5 mm (3/8”) diameter drill (E5001002). The hole may be placed medial and anterior to the anteromedial corner of the intercondylar notch, in the center of the trochlear groove, or 1 cm (.4”) anterior to the PCL origin. | FIGURE 1

FIGURE 1

Alignment rod insertion

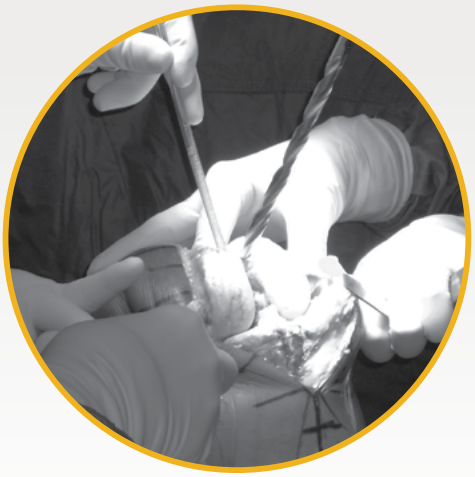
Insert the fluted IM reamer/rod (E5001003) into the femoral canal, being sure to irrigate and aspirate several times to reduce the chance of a fat embolus. Turn the reamer during insertion with the T-handle (E5001001). | FIGURE 2

FIGURE 2

Efficiency suggestion

Some surgeons prefer the distal femoral alignment guide (E1101001), valgus busing (E1100357) and resection guide (E1000010) pre-loaded on the IM rod (E5001003) before it is introduced into the femur. After insertion, the T-handle (E5001001) is maintained on the rod for faster rod removal after the resection block (E12041XX) is pinned. | FIGURE 3

FIGURE 3



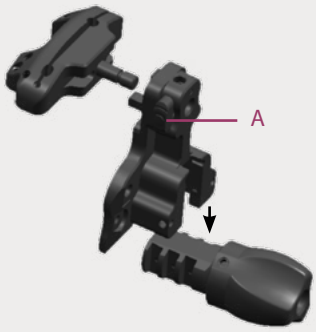
Retractors and placement:

- Knee should be in >90° flexion
- “Z” Retractor - superior lateral on femur to lift skin out of way of distal resection guide
- “Z” Retractor - medial on femoral condyle or tibia to protect collateral ligament

IMPORTANT NOTE: All Evolution® femoral resection slots are designed for use with a .050" (1.3 mm) thick saw blade. Wide 1" (25.4mm) saw blades are recommended for the distal resection.

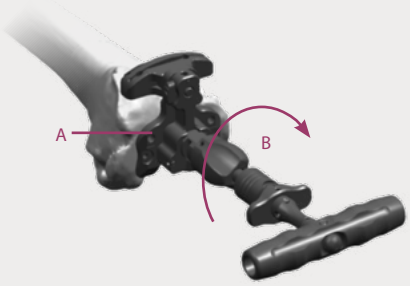
Distal resection guides are available in 10mm (E1000010), 12mm (E1000012), and 10 & 14mm (E1000114). Load the appropriate distal resection guide onto the distal femoral alignment guide (E1101001) and lock them together by pushing the locking button from left to right. | **A IN FIGURE 4** A lock icon will be visible. Insert the distal femoral alignment guide (E1101001) onto the valgus bushing (E1100357). | **FIGURE 4** The valgus bushing (E1100357) has both a "Left" and "Right" side, and has three slots which allow 3°, 5°, or 7° of valgus. Ensure the "Left" side of the bushing is facing up for a left knee, and the "Right" side is facing up for a right knee.

FIGURE 4



Slide the valgus bushing (E1100357) down the IM rod (E5001003) toward the T-handle (E5001001) connection. Insert the fully assembled IM rod into the intramedullary canal until the distal femoral alignment guide (E1101001) rests against the unresected prominent distal condyle. | **FIGURE 5** Although rotation is not critical at this step, the distal femoral alignment guide (E1101001) features two lines which may be aligned with the epicondyles. | **A IN FIGURE 5** Lock the valgus bushing (E1100357) to the IM rod (E5001003) by turning the knob until it is tight. | **B IN FIGURE 5**

FIGURE 5



Retractors and placement:

- Knee should be in >90° flexion
- "Z" Retractor – Posterior lateral on femur
- Bent Hohmann – Antero-lateral on femoral cortex

P/N E1000010

P/N E1000012

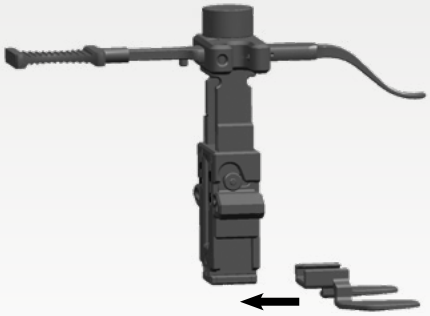
P/N E1000114

P/N E1101001

P/N E1100357

FIGURE 6

FIGURE 7



Retractors and placement:

- Knee should be in >90° flexion
- “Z” Retractor – Posterior lateral on femur
- Bent Hohmann – Antero-lateral on femoral cortex

Pin the distal resection guide (E1000XXX) to the anterior cortex with two headless pins through the “STD” holes. These are the most proximal holes on the guide. If the pins are left too proud, they may impinge on the saw and prevent full saw penetration. Push the locking button to detach the resection block and remove the IM rod (E5001003), distal femoral alignment guide (E1101001) and valgus bushing (E1100357). Use of a divergent pin is recommended to prevent the distal resection guide (E1000XXX) from vibrating off the pins during resections. In the absence of a divergent pin, a kocher can be clipped to the pin to provide stability. | FIGURE 6

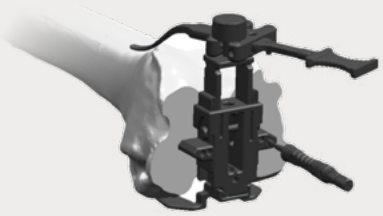
NOTE: At this point the proximal tibia may be resected. This allows easier placement of the femoral sizing caliper under the posterior condyles.

Femoral sizing and rotation

The caliper must be set for the appropriate knee. For example: If used on a right knee, the “Right” marking must be facing the observer and the “Left” marking should be against the bone. To set the caliper for the opposite knee, remove the posterior feet, rotate the caliper and reinsert the feet. | FIGURE 7

Place the sizing caliper (E1100101) flush against the resected distal femur. Adjust the sizer so the posterior feet (E110013X) rest against the posterior condyles. The stylus (E1100112) should be set to the expected femoral size (femoral size is presumed based on preoperative templating) and clipped to the medial side of the caliper. The stylus (E1100112) size markings are read through the hole in the stylus body. | **A IN FIGURE 8**.

FIGURE 8

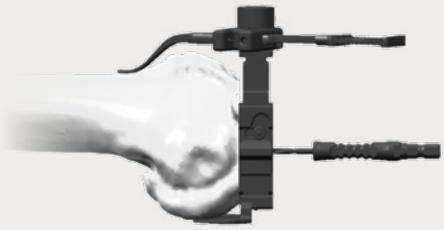


P/N E1100101

P/N E110013X

Ensure the caliper (E1100101) rests flat on the distal surface. | **FIGURE 9**

FIGURE 9

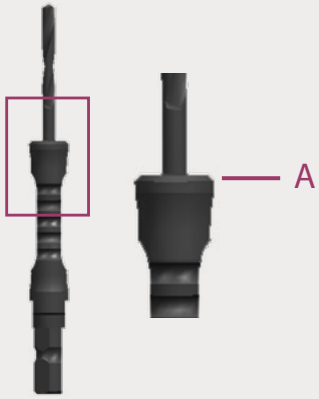


P/N E1100112

P/N E1000201

The tip of the stylus (E1100112) should touch the most prominent aspect of the anterior cortex just proximal to the lateral anterior condyle. The femoral size is read through the windows in the anterior face of the sizing caliper (E1100101). Sizes are represented by shaded areas. The 4-in-1 resection block (E12041XX) preparation holes are drilled through the 3° holes with the 3.2 mm (1/8”) drill bit (E1000201) which features a shoulder at the correct depth. | **A IN FIGURE 10**

FIGURE 10



P/N E12041XX

FIGURE 11

The preparation of the holes will set 3° of external rotation relative to the posterior condylar axis. In a severe varus or valgus knee, the posterior condylar axis may not be a reliable reference for femoral rotation; instead, rotation may be set visually by referencing the A/P axis or epicondyles. If rotation must be set visually, the caliper (E1100101) features a central window with crosshairs. With the sizing caliper (E1100101) resting on the distal resection, the crosshair may be aligned with the A/P axis or the epicondyles. | **FIGURE 11** Once aligned, the peg holes are drilled through the 0° holes.

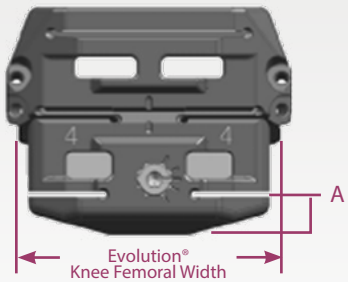
Retractors and placement:

- Curved single-prong Hohmann – Superior-lateral on femoral cortex
- "Z" Retractor – Posterior lateral on femur
- "Z" Retractor – Posterior medial on femur to protect medial collateral ligament

Anterior and posterior resections

NOTE: Take care to protect the collateral ligaments during resections.

FIGURE 12



Select the 4-in-1 femoral resection block (E12041XX) corresponding to the size indicated by the femoral sizing caliper (E1100101) . Make sure the 4-in-1 femoral resection block (E12041XX) is set to zero at the beginning of the case. Place the pegs on the back of the femoral resection block (E12041XX) into the holes drilled through the sizing caliper (E1100101). The femoral resection blocks (E12041XX) may be used to double-check the femoral size. The width of the resection block (E12041XX) on the step just posterior to the level of the pinholes represents the width of the femoral component. The distance from the top of the posterior slot to the central bottom portion of the guide represents the thickness of the posterior condyles of the implant. | **A IN FIGURE 12**

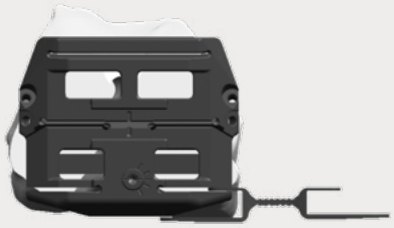
To ensure appropriate posterior condyle resection, utilize the posterior condylar gauge (E1200113). | FIGURE 13 The inside of the gauge equals the thickness of the implant posterior condyles (10mm for sizes 1-4; 11mm for sizes 5-8). The thickness of the outside of the gauge equals approximately 2mm more (12mm for sizes 1-4; 13mm for sizes 5-8).

NOTE: It is recommended to remove 2mm more bone than the implant thickness from the medial side during the posterior resection.

To ensure an appropriate anterior resection, utilize the dual reference “angel wing” gauge (E5001006). If it appears too much or too little of the posterior condyles are being removed or that there will be anterior notching, the 4-in-1 femoral resection block (E12041XX) may be adjusted up to 2mm (.08”) anterior or posterior with the 3.5mm hex head screwdriver (E5001005). Place the screwdriver (E5001005) into the adjustment dial and push the dial inward, then turn the dial in increments of 1mm. | FIGURE 14

If rotation of the femoral resection block (E12041XX) must be adjusted, utilize the 2-degree re-drill guide (E1100002). Remove the femoral resection block (E12041XX) and insert the re-drill guide (E1100002) into the peg holes. Re-drill the holes in the desired rotation and reinsert the femoral resection block (E12041XX). | FIGURE 15

FIGURE 13



P/N E1200113

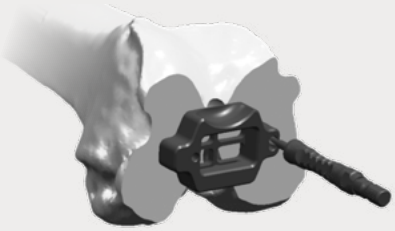
P/N E5001006

P/N E5001005

P/N E1100002

FIGURE 14

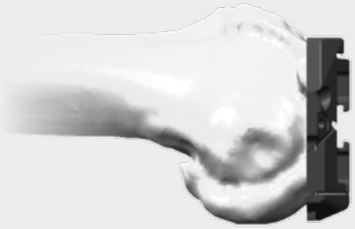
FIGURE 15



P/N E5002001

P/N E5002002

FIGURE 16



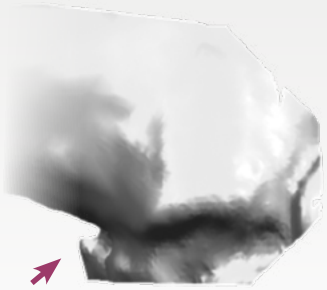
Ensure the resection block (E12041XX) rests flat on the distal surface. | FIGURE 16

FIGURE 17

Stabilize the block (E12041XX) against the bone using four 3.2 mm (1/8”) diameter pins on the medial and lateral sides of the block (E12041XX). | FIGURE 17 If two pins are preferred, place one pin low and the other high contralaterally. The recommended order of resection is: anterior, posterior, posterior chamfer, anterior chamfer. After resections have been made, the pins are withdrawn, and the block (E12041XX) is removed with the slaphammer (E5002001) and the extraction boss (E5002002). | FIGURE 18

FIGURE 18

FIGURE 19



osteophyte

Care should be taken to remove posterior condylar osteophytes to avoid impingment with the posterior portion of the tibial component. |FIGURE 19

Trunnion & stem preparation

- If pins were removed during trialing, re-insert the pins.
- Assemble the cut-through valgus bushing guide to the cut-through femoral trial using a 3.5mm driver.
- Lock the trunnion reamer bushing into the valgus bushing by turning clockwise.
- Use a 3.5mm driver to tighten the locking knob on the valgus bushing.
- Ream for the trunnion using the long trunnion reamer until it comes to a stop.
- Insert reamer sleeve into the trunnion reamer bushing and ream for the desired stem length to the indicated marking.
- Remove the valgus bushing, trunnion reamer bushing, and reamer sleeve.

NOTE: The trunnion reamer and trunnion bushing is part of the Evolution® Revision Tibia Kit (E400KIT1).

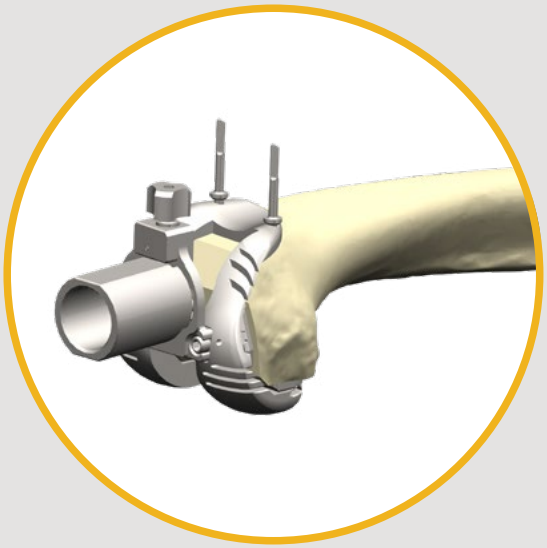
Femoral augment resections

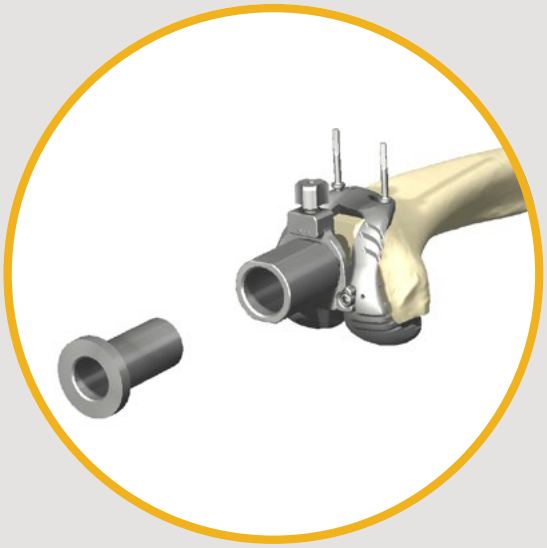
- The cut-through femoral trial contains 4, 8, and 12mm distal and posterior augment cut slots.
- If necessary, make the 4mm and/or the distal and posterior augment resections.
- Assemble distal and posterior augment trials into place.

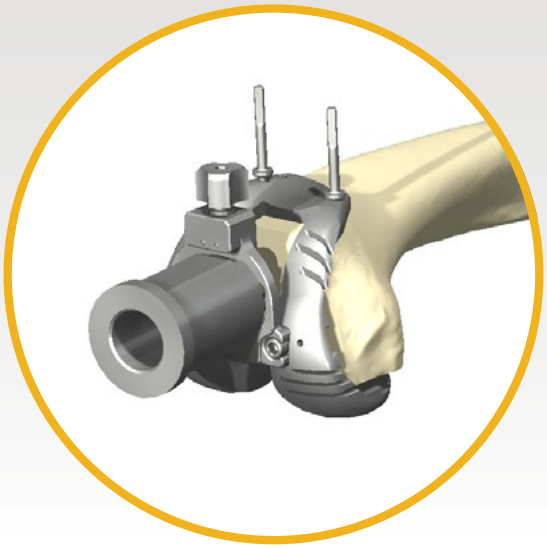
NOTE: It is critical to remove any bone fragments after resection as they made impede augment trial placement. If this occurs, remove the cut-through femoral trial construct, remove the fragments, and replace the components.

NOTE: All augment trials are grouped by size; however, distal the streamlined kit only includes 4mm augments. To use 8mm or 12mm augments use the full E400KIT2. augment trials are also side- and medial-/lateral-specific.

NOTE: the streamlined kit only includes 4mm augments. To use 8mm or 12mm augments use the full E400KIT2.







P/N E630346L, E630078L, E630346R, OR E630078R

P/N E63043RL - E63048RL OR E63043RR - E63048RR

P/N E243118F

P/N E2030004

P/N E1604345, E1604678

P/N E1704351, E1708351, E1712351, E1704681, E1708681, E1712681

P/N E2005079

P/N E2831725 OR E2831750

P/N E2230050

P/N E6001007

P/N E1205403-E1205408

P/N E120543L-E120548L
OR E120543R-E120548R

CS assembly - If trochlear groove was not previously prepared with primary instruments

- Assemble the stemmed CS sulcus burr guide onto the cut-through femoral trial by aligning the captured screws to the screw holes on the cut-through femoral trial.
- Tighten the screws on the sulcus burr guide ising a 3.5mm hex driver.
- Resect for the sulcus using the sulcus burr.
- If desired, slide the stem adapter into the resected intercondylar space to ensure that enough bone has been cleared for the sulcus.

CS femoral trial assembly

- Remove the pins, and remove the cut-through femoral trial construct from the femur.
- Disassemble the stemmed CS sulcus burr guide by loosening the screws with a 3.5mm driver
- If stem extension adapter is required, thread the appropriate trial stem into the bottom of the stem extension broach.
- Insert this construct into the trunnion on the stem adapter and tighten the captured pass through screw with a 3.5mm hex driver.
- If only a stem is required, insert the appropriate trial stem into the trunnion of the stem adapter and tighten the captured pass-through screw with a 3.5mm driver.
- Align the captured screws on the stem adapter with the screw holes on the cut-through femoral trial and tighten the construct using a 3.5mm driver.
- If distal and posterior augments are needed, select the appropriate size trials and slide onto the cut-through femoral trial from the side.
- Complete trial reduction with appropriate CS trial insert

Optional transition to a CCK

- If additional constraint is desired pin the cut through femoral trial into place using the anterior pin holes
- Completely loosen the two screws on the stem adapter
- Use the slap hammer if necessary to remove the stem adpater construct
- Continue with box resection procedure on the following page.

Intercondylar bone preparation for CCK

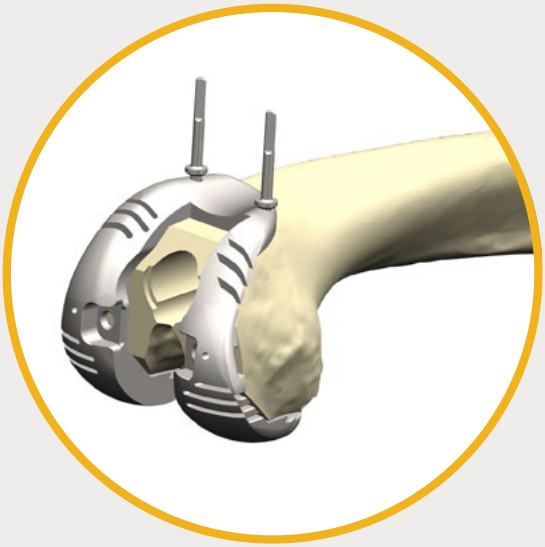
- Assemble the box cut guide into the cut-through femoral trial by aligning the captured screws on the box cut guide to the screw holes on the cut-through femoral trial.
- Tighten the screws on the box cut guide using a 3.5mm driver.
- Resect for the box using a narrow oscillating saw or reciprocating saw.

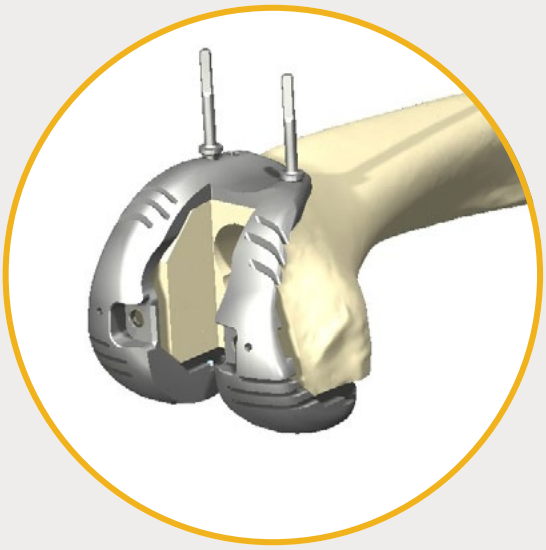
NOTE: There are two additional pin holes on the anterior portion of the box cut guide, which will allow the attachment of the dual fulcrum if a captured resection is desired. The dual fulcrum attachment can be ordered by SKU, P/N K0014027.

- If desired, slide the box stem adapter into the resected intercondylar space to ensure that enough bone has been cleared for the box.

CCK femoral trial assembly

- Remove the pins, cut-through femoral trial.
- If stem extension adapter is required, thread the appropriate trial stem into the bottom of the stem extension broach.
- Insert this construct into the trunnion on the box and stem adapter and tighten the captured pass through screw with a 3.5mm hex driver.
- If only a stem is required, insert the appropriate trial stem into the trunnion of the box and stem adapter and tighten the captured pass-through screw with a 3.5mm driver.
- Align the captured screws on the box stem adapter with the screw holes on the cut-through femoral trial and tighten the construct using a 3.5mm driver.
- If distal and posterior augments are needed, select the appropriate size trials and slide onto the cut-through femoral trial from the side.





P/N E120533L - E120538L OR
E120533R - E120538R

P/N E2831725 OR E2831750

P/N E2230050

P/N E1005101

P/N E310XXXR/L

P/N E350XXXL/R

Femur

Tibial base	3	4	5	6	7	8
3	3	3+				
4	4	4	4+			
5		5	5	5+		
6	CS insert options			6	6+	
6+				6		
7					7	7+
8					8	8

Femur

Tibial base	3	4	5	6	7	8
3	3	3				
4	4	4	4			
5		5	5	5		
6	CCK insert options			6	6+	
6+				6		
7					7	7
8					8	8
8+						8

Final flexion/extension gap analysis

- If not prepared previously, use the appropriate desired tibia surgical technique for tibial preparation. (012303, 013782 or 010793) If a CCK was used, a stemmed tibia must also be used.
- If desired and not previously prepared, prepare the patella per the primary surgical technique, 010793.
- After tibia and patella preparation, perform final flex/ext gap analysis.
- Impact the previously-assembled trial tibial construct onto the tibia using the trial base impactor.
- Impact the final trial femoral construct onto the femur using the femoral impactor.
- Select the appropriate size and thickness trial insert. Insert the trial insert onto the trial tibial base by first engaging the posterior edge of the insert and then snapping the anterior portion into place.

NOTE: If distal augment trials are present, it is necessary to use the finishing impactor rather than the femoral impactor.

- Once the trial components are in place, reduce the patella and perform the preferred balancing tests to ensure stability in flexion while still allowing full extension.
- Remove the monolithic base trial with the slaphammer by attaching the trial base impactor into the available slots.
- Verify the rotational position of the keel and offset adapter on the monolithic base trial assembly with the offset and rotation recordings.
- Remove the trial femoral construct with the slaphammer by attaching the femoral impactor into the dovetail slots on the stem adapter.

Size interchangeability

- The Evolution® Revision System allows for 1-up, 1-down interchangeability between the femur and tibia for all styles.
- Refer to the sizing chart at the right for size interchangeability, and see the implant dimension charts in Chapter 5 for a more detailed look at the options available for use.
- Be aware of the size 6+ tibial bases; these are required for the articular surface groupings built into the system.

Femoral implant assembly

- Select the correct size CCK or stemmed CS femoral component, revision tibial base implant, and CCK or CS insert as well as the appropriate stem, augments, and offset adapter/stem extension (if required).
- Follow one of the four methods below based on the selected components.

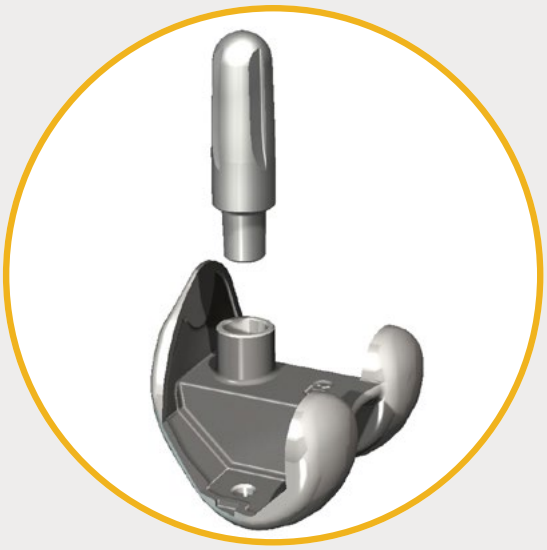
NOTE: The femoral implants are packaged with a polyethylene plug. Place the plug in the trunnion if no stem extension is being used on the femur to prevent cement form entering the trunnion.

Stem only

- Place the femoral component on a sterile, rigid surface.
- Assemble the stem into the trunnion and impact with three firm mallet blows directly to the stem.

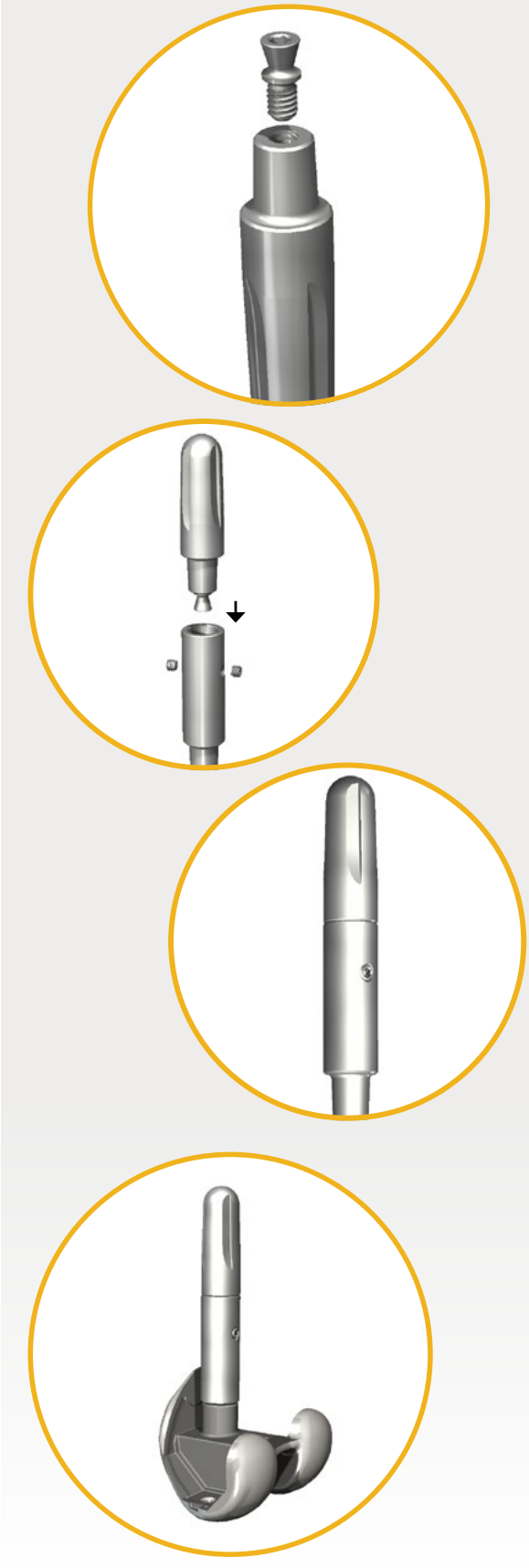
Augment(s) and stem

- Assemble the augment(s) to the 4mm femoral component.
- Using the screw packaged with the augment, secure the augment to the femoral implant.
- Following removal of the plastic starter handle, final tightening is completed with a 3.5mm driver.
- Place the construct on a sterile, rigid surface. Assemble with the stem into the trunnion and impact with three firm mallet blows directly to the stem.



P/N EFCCN3RL-EFCCN8RL
OR EFCCN3RR-EFCCN8RR

P/N EFSRN3RL-EFSRN8RL
OR EFSRN3RR-EFSRN8RR



Extension adapter and stem

- Screw the secondary locking screw, packaged with the extension adapter, into the top of the stem and tighten with a 3.5mm driver.
- Place all components on a sterile, rigid surface.

NOTE: It may be necessary to slightly back out the side set screws before implant assembly.

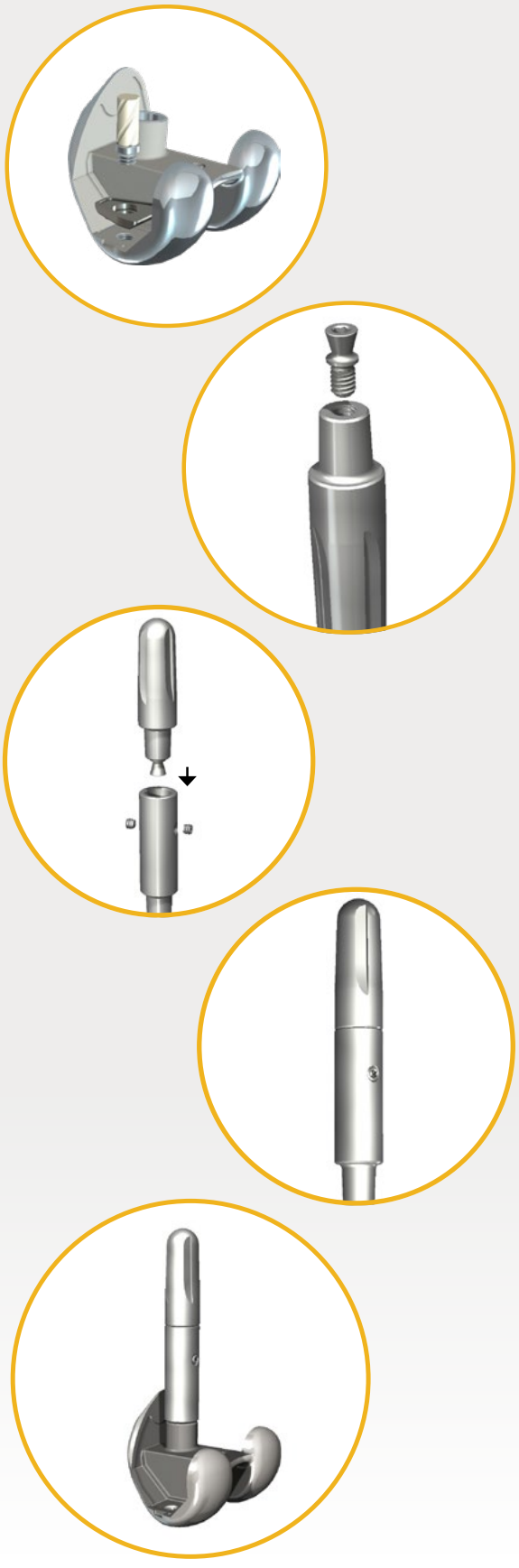
- Insert the male taper of the stem into the female taper of the extension
- Impact the stem into the extension with three firm mallet blows directly to the stem.
- Tighten down the side set screws with the hexalobe driver
- Insert the extension and stem construct into the femur. Impact with three firm mallet blows directly to the stem.

Augment(s)

- Assemble the augment(s) to the femoral component.
- Using the screw packaged with the augment, secure the augment to the femoral implant.
- Following removal of the plastic starter handle, final tightening is completed with a 3.5mm driver.

Tibial implant assembly

- Assemble the tibial construct the appropriate surgical technique corresponding to the tibial preparation.



P/N ESCXXXXX

P/N EFDANXXX

P/N EFPANXXX

P/N ESRK0050

Explant information

If the removal of the implant is required due to revision or failure of the device, the surgeon should contact the manufacturer using the contact information located on the back cover of this surgical technique to receive instructions for returning the explanted device to the manufacturer for investigation.

FEMUR, TIBIA, AND PATELLA COMPONENTS
To remove the components, small osteotomes, power saws, or other surgical instruments may be used to disrupt the bone-cement interface and bone ingrowth into porous coating. Once the components have been removed, rongeurs or small osteotomes as well as other surgical instruments may be used to remove the remaining cement.

INSERT REPLACEMENT
A narrow osteotome may be inserted into the anterior region of the insert to facilitate removal. A hemostat may be used to remove the insert once it is no longer locked to the tibial base. Care must be taken not to scratch or mar any component that is not intended to be removed.

MicroPort Orthopedics

Full Function, Faster®

MicroPort Orthopedics Inc.
5677 Airline Road
Arlington, TN USA 38002
866 872 0211

microportortho.com

The CE-Marking of Conformity is applied per catalog number and appears on the outer package label, if applicable.

019568/A NOV 2019